



Effect of the interaction between outdoor air pollution and extreme temperature on daily mortality in Shanghai, China

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Abstract:

Background: Both outdoor air pollution and extreme temperature have been associated with daily mortality; however, the effect of their interaction is not known. **Methods:** This time-series analysis examined the effect of the interaction between outdoor air pollutants and extreme temperature on daily mortality in Shanghai, China. A generalized additive model (GAM) with penalized splines was used to analyze mortality, air pollution, temperature, and covariate data. The effects of air pollutants were stratified by temperature stratum to examine the interaction effect of air pollutants and extreme temperature. **Results:** We found a statistically significant interaction between PM 10/O₃ and extreme low temperatures for both total nonaccidental and cause-specific mortality. On days with "normal" temperatures (15th-85th percentile), a 10- $\mu\text{g}/\text{m}^3$ increment in PM 10 corresponded to a 0.17% (95% CI: 0.03%, 0.32%) increase in total mortality, a 0.23% (0.02%, 0.44%) increase in cardiovascular mortality, and a 0.26% (-0.07%, 0.60%) increase in respiratory mortality. On low-temperature days (<15th percentile), the estimates changed to 0.40% (0.21%, 0.58%) for total mortality, 0.49% (0.13%, 0.86%) for cardiovascular mortality, and 0.24% (-0.33%, 0.82%) for respiratory mortality. The interaction pattern of O₃ with lower temperature was similar. The interaction between PM 10/O₃ and lower temperature remained robust when alternative cut-points were used for temperature strata. **Conclusions:** The acute health effects of air pollution might vary by temperature level.

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Resource Description

Exposure : ☒

weather or climate related pathway by which climate change affects health

Air Pollution, Meteorological Factors, Temperature

Air Pollution: Interaction with Temperature, Ozone, Particulate Matter, Other Air Pollution

Air Pollution (other): SO₂, NO₂

Temperature: Extreme Cold, Extreme Heat

Geographic Feature: ☒

resource focuses on specific type of geography

Ocean/Coastal, Urban

Climate Change and Human Health Literature Portal

Geographic Location:

resource focuses on specific location

Non-United States

Non-United States: Asia

Asian Region/Country: China

Health Impact:

specification of health effect or disease related to climate change exposure

Cardiovascular Effect, Morbidity/Mortality, Respiratory Effect

Cardiovascular Effect: Other Cardiovascular Effect

Cardiovascular Disease (other): cardiovascular mortality

Respiratory Effect: Other Respiratory Effect

Respiratory Condition (other) : respiratory mortality

Resource Type:

format or standard characteristic of resource

Research Article

Timescale:

time period studied

Time Scale Unspecified